



An Evaluation of The Critical Care Nurses' Knowledge Concerning Endotracheal Suctioning for Adult Patients at The Teaching Hospitals of Al-Anbar, Iraq

Running Title: Endotracheal-Suctioning For Critical-Care Nurses

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Abstract:

Background: Endotracheal suctioning (ETS) is a commonly performed invasive procedure by critical care nurses (CCNs) to eliminate accumulated pulmonary secretions, therefore, maintains patency of the airway to ensure proper ventilation and oxygenation, while also preventing atelectasis.

Objectives:

In order to evaluate ICU nurses' knowledge regarding endotracheal suctioning for adult patients and identify the correlation between demographic characteristic data and their level of expertise, the current study set out to collect and analyze data.

Methods: A cross-sectional design study was carried out in critical care units at two teaching hospitals. The study period was extended from 1st November 2023 to 28th January 2024. We conducted a nonprobability purposive sampling with 80 nurses working in critical care units in Al-Anbar city hospitals, Iraq, as the target population. Data were collected using a developed questionnaire. Study instruments consist of two parts. First, the demographic sheet included socio-demographic information about the participants. The second part includes nurses' knowledge of endotracheal suctioning. The data collected was analyzed in SPSS version 26.

Results: Findings of the current study showed nearly half (47.5%) of critical care nurses had a fair level of knowledge regarding Endotracheal Suctioning based on a total mean of scores= (1.80).).

Conclusion: The research revealed a significant lack of involvement in ETS training or educational programs among most critical-care nurses, perhaps impacting their moderate knowledge level on the topic

Keywords: "Knowledge evaluation, adult patients, endotracheal suctioning, and intensive care unit nurses"

Introduction:

Endotracheal suctioning (ETS) is a commonly performed invasive procedure by critical care nurses (CCNs) to eliminate accumulated pulmonary secretions ^(1,2). Therefore, maintain patency of the airway to ensure proper ventilation and oxygenation, while also preventing atelectasis ^(3,4).

Infections acquired by critical care nurses are most likely to be acquired by nurse due to their first-line contact with patients ^(5,6). Nosocomial or hospital-acquired infection occurs when there is an interaction among the infected patients, healthcare personnel, equipment, and bacteria ⁽⁷⁾. The majority of patients admitted to critical care units have an increase in airway secretions and encounter challenges in effectively removing these secretions. This is mostly attributed to the presence of an artificial airway, reduced ciliary clearance, and impaired cough reflex. Consequently, these individuals need suctioning to preserve their respiratory function ⁽³⁾. This therapeutic management can be accomplished by intubation. One method involves inserting an endotracheal tube through the mouth, known as orotracheal intubation, while another method involves inserting it through the nose, known as nasotracheal intubation. The tube is carefully guided through the larynx, passing between the vocal cords and into the trachea ⁽⁸⁾.

In many cases, orotracheal intubation is a straightforward and direct method. However, for patients with jaw fractures, nasotracheal intubation is often chosen for its added comfort ⁽⁹⁾. There are currently two methods or systems for performing the procedure: open and closed. In the first, the respiratory circuit must be opened by disconnecting the mechanical ventilator from the ventilatory prosthesis, followed by suctioning with a single-use catheter; in the second, which does not require disconnecting the ventilator, the suction catheter is reusable and may remain connected to the system for up to 24 hours, as recommended by the manufacturer ⁽¹⁰⁾.

The nurse plays a vital role in the care of patients with endotracheal tubes (ETT) by administering oral care every 2 hours, closely monitoring the patient's respiratory state and the correct insertion of the

endotracheal tube, and repositioning the client to prevent hazards of immobility (e.g. pneumonia), Perform suctioning of secretions from the lung which the patient is unable to mobilize it, Carefully observe any secretions that the patient expectorates ⁽¹¹⁾.

If ETS is not performed according to evidence-based practice, Ventilator-associated pneumonia, atelectasis, hypoxemia, cardiovascular instability, increased intracranial pressure, tracheobronchial injuries, and bleeding are among the several issues that might arise ^(1,12,13).

Ventilator-associated pneumonia is a common and severe infection that frequently affects critically ill patients undergoing mechanical ventilation And therefore excessive length of intensive care unit (ICU) and hospital stays, and high hospital costs ⁽¹⁴⁾. Improved outcomes will shorten patients' CCU length of stay, and hospitalization as well as benefit the patient financially with decreased hospital costs ^(15,16).

Methods:

Study design and setting

This study employed a descriptive cross-sectional study design to assess the knowledge of ICU nurses about endotracheal suctioning for adult patients and to determine the relationship between demographic characteristic data with nurse's knowledge. The study was conducted among nurses who work in four adult critical care units of a tertiary teaching hospital in Al-Anbar City, between 1st November 2023, to 28th January 2024. Intensive care units have a total of 50 beds and the total of nurses who work in eight critical care units constitutes (133).

Sample selection

The study population was all CCU staff nurses who were available during data collection time and working in an adult intensive care unit for more than 1 year in teaching hospitals in Al-Anbar City, Iraq.

Inclusion and exclusion criteria

All male and female nurses employed in critical care units at certain hospitals, together with those who agreed to participate in the study and were accessible for data collection, were the inclusion

criteria for the sample selection, nurses in administrative roles; nurses unavailable for data collection; critical-care nurses chosen for the Pilot Study; and medical personnel not in the nursing field, such as assistants to anesthesiologists.

Sampling and sample size

Non-probability purposive sampling was used to include 80 CCU nurses from two teaching hospitals in Al-Anbar city. The sample size determined by using a single population proportion formula and considering the following assumptions: = total population (nurses) = 107, 95% confidence, 5% error $5/100=0.05$, If $N = 107$ $n = \text{sample size}$ $E = \text{margin of error}$ $n = N / [1 + (N) (E)^2]$ $n = 107 / [1 + 107 (0.05)^2]$, $n = 133 / [1 + 107 (0.0025)]$, $n = 107 / [1 + 0.3325]$, $n = 107 / 1.3325$, $n = 80.3=80$. Raosoft software was used with a set confidence interval of 5% and a confidence level of 95% to determine the sample size.

Data collection and outcome measurements

There are two components to the data collecting tools:

Part I: Socio-Demographic Options comprising seven items formulated to determine age, gender, educational qualification, total years of experience as a nurse, experience in critical care units, previously attended educational or training program, self-educated statement, and academic preparation curriculum. Participants received the demographic and questionnaire together; since no name was required on these forms, an identification number was assigned to ensure the reliability for statistical analysis purposes.

Part 2: A structured knowledge questionnaire consists of (20) items developed by the researcher founded on a thorough analysis of the literature and recommended practices for the ETS method that are supported by evidence. The goals and objectives of both the educational program and data collection

tool were developed using Bloom's Taxonomy methodology to meet the study objectives.

Scoring system: A score of one grade was given for the correct answer and a score of zero was given for the wrong answer. The total score was calculated as follows:

❖ Nursing knowledge assessed based on the total of scores

- 1-1.33 = poor knowledge.
- 1.34-1.66 = Fair knowledge.
- 1.67-2 = Good knowledge.

Statistical analysis

The GraphPad Prism 8 software was used for the statistical analysis. The measured parameters' values were given as mean $\pm$ standard deviation (SD). For group comparisons, one-way analysis of variance (ANOVA) and independent sample t-test were employed to determine the association between nurses' knowledge with certain demographic characteristics. All the data were analyzed with SPSS Statistics (version 26).

Results:

The study's findings revealed that males made up the majority of study participants (66.2%), while females made up the remaining 33.8%. The average age of the participants was ($M \pm SD = 27.69 \pm 4.530$), with a minimum age of 22 and a maximum age of 40. Most of the study participants (45%) with the age group of 22- less than 26 years, (61.2%) of nurses had holding a Diploma degree. Three-quarters of nurses (76.2%) had experience in a hospital from 1 to 6 years, and (98.8%) of them had worked in a critical care unit from 1 to 6 years. The study results indicated that approximately three quarter of study participants (74%) with a total of mean (M , $SD = 1.80 \pm .701$) had a fair level of knowledge regarding Endotracheal Suctioning and for most of the socio-demographic variables considered, there is no significant difference in the knowledge scores among different groups.

Table (1): Distribution of Participants according to their Socio-demographic Characteristics

n	Characteristics		f	%
1	Age (year) M±SD= 27.69 ± 4.530	22 – less than 26	36	45
		27 – less than 31	27	33.8
		32 – less than 36	13	16.2
		37 – less than 41	4	5
		Total	80	100
2	Sex	Male	53	66.2
		Female	27	33.8
		Total	80	100
3	Level of education	Secondary school	5	6.3
		Diploma	49	61.2
		Bachelor	26	32.5
		Total	80	100

Table (2): Distribution of Participants according to their Professional Characteristics

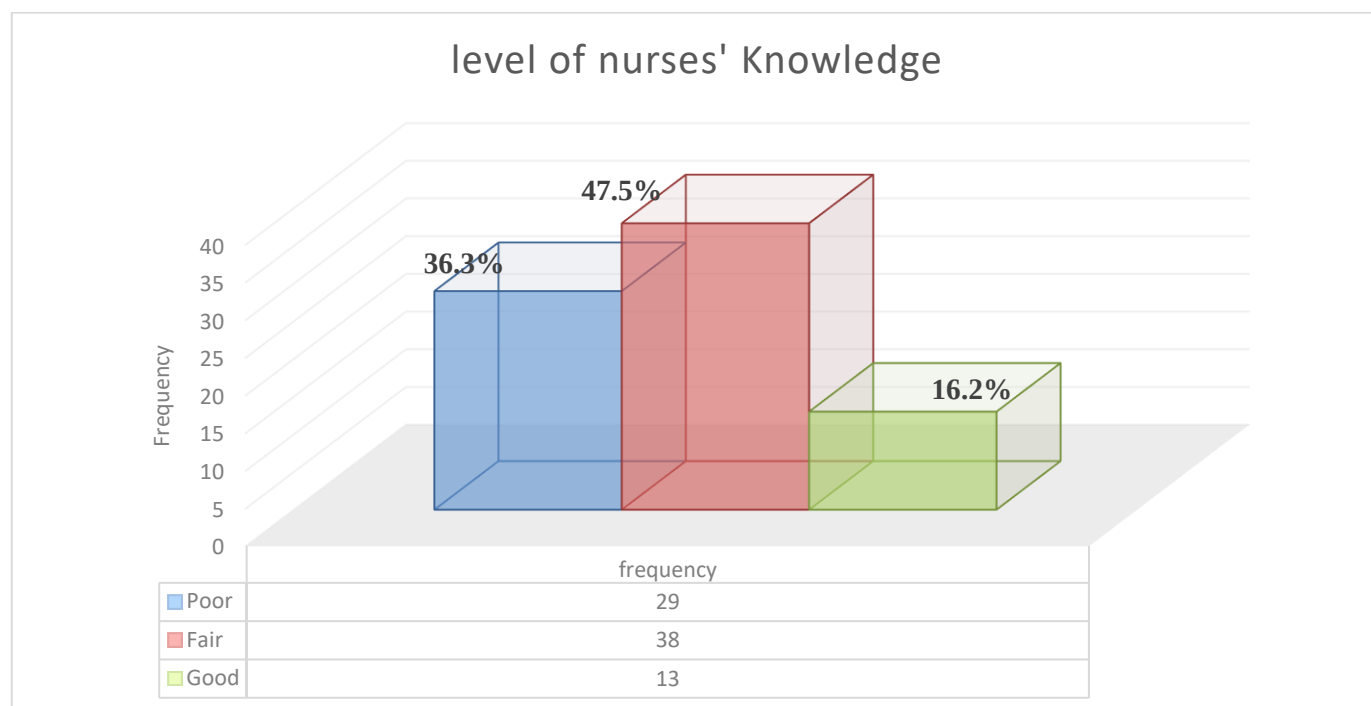
n	Characteristics		f	%
1	Years of service in the profession M±SD= 4.519 ± 3.276	1 – less than 6	61	76.2
		6 – less than 11	15	18.8
		11 – less than 16	4	5
		16 and more	0	0
		Total	80	100
2	Years of experience as CCN M±SD= 2.588 ± 1.519	1 – less than 6	79	98.8
		6 – less than 11	1	1.2
		11 – less than 16	0	0
		16 and more	0	0
		Total	80	100
3	Participation in training courses	No	61	76.2
		Yes	19	23.8
		Total	80	100
4	Number of courses	Not participated	61	76.2
		One	12	15
		Two or more	7	8.8
		Total	80	100

Table (3-16): Overall Assessment of nurses' Knowledge regarding Endotracheal Suctioning

Levels of knowledge	f	%	M	S.D	Assessment
Poor	29	36.3	1.80	.701	Fair
Fair	38	47.5			
Good	13	16.2			
Total	80	100			

f: Frequency, %: Percentage, M: Mean of total score, SD Standard deviation of total score Poor= 1 – 1.66, Fair= 1.67 – 2.33, Good= 2.34 – 3

This table presents the overall assessment of nurses' knowledge regarding Endotracheal Suctioning; the findings reveal that nurses show fair level of knowledge (47.5%, $M \pm SD = 1.80 \pm .701$).

**Figure (3-1): Levels of nurses Knowledge about endotracheal suctioning**

This figure reveals that nurse show fair level of knowledge (47.5%) and (36.3%) had poor knowledge

Table (3): Association between Nurses Knowledge with their Socio. Demographic charectrestics

Socio. Demographic Variables		Sum of squares	df	M.S	F	P value	Sig.
Age Group	Between groups	.352	1	.352	.714	.401	N.S
	Within groups	38.448	78	.493			
	total	38.800	79				
Educational level	Between groups	6.125	2	3.06	7.217	.001	H.S
	Within groups	32.675	77	.424			
	Total	38.800	79				

years of experience in Nursing	Between groups	2.961	2	1.48	3.181	.047	N.S
	Within groups	35.839	77	.465			
	total	38.800	79				
Years of experience in CCU	Between groups	1.458	1	1.45	3.046	.085	N.S
	Within groups	37.342	78	.479			
	total	38.800	79				

This table presents the results of a statistical analysis of a study sample of 80 individuals. It focuses on their knowledge in relation to various socio-demographic variables: Age Group, Educational Level, Years of Experience in Nursing, and Years of Experience in CCU (Critical Care Unit). Most of the results in the table are marked as “N.S” (not significant) except the educational level variable indicates high significance. This means that for most of the socio-demographic variables considered, there is no significant difference in the knowledge scores among different groups⁽¹⁷⁾

Variable		M	SD	t	df	p≤ 0.05	Sig
sex	Male	1.89	.725	1.566	78	.121	N.S
	Female	1.63	.629				
Participation in training courses	No	1.77	.693	.672	78	.503	N.S
	Yes	1.89	.737				
Self-education	No	1.83	.705	1.324	78	.189	N.S
	Yes	1.40	.548				

M: Mean, SD: Standard deviation, t: t-test, df: Degree of freedom, Sig: Significance, p: Probability value, N.S: Not significant, S: Significant, H.S: High significant

This table indicates that there is no significant relationship between overall nurses' knowledge, practice, and their sex at p-value= .121 for knowledge. There is no significant relationship between overall nurses' knowledge and their Participation in Training Courses at p-value= .503 for knowledge. Also, there is no significant relationship between overall nurses' knowledge and their Self-education at p-value= .189 for knowledge

Discussion:

Regarding knowledge of critical-care nurses, the developed questionnaire consisted of two parts (demographic variables and knowledge tool) .our study findings indicated that the greater percentage (45%) of critical-care nurses was within the age

group of 22- less than 26 years, (33.8%) was in the age group 27- less than 31, (16.2%) was in the age group 32- less than 36 years, and lastly (5%) was in the age group 37 – less than 41 years. In terms of gender, the majority of participants (66.2%) are male and the remaining 33.8% are female. This discovery validates ⁽¹⁵⁾. The researcher reported that the majority of studied nurses were male (64%). We assumed that the number of male nurses was greater as they engaged in nursing schools in order to easily find a job after graduation and another reason might be due to working in critical care units needing more muscular strength to move and care for highly dependent patients. According to the subjects' educational qualifications,

A nursing diploma was had by the majority of respondents (61.2%). This agreement with ⁽¹⁸⁾, and ⁽¹⁹⁾ revealed that the majority of the nurses held nursing diplomas, and the data indicated that the proportion of nurses with diplomas exceeds that of nurses with any other degrees. ⁽²⁰⁾ found that the majority of participants (60.2%) were holding a diploma in nursing. Hence, this may impact the level of nurses' knowledge and practices in terms of providing high-quality nursing care. Nonetheless, our result demonstrated that only (32.5%) held a Bachelor of Science in Nursing degree. Critical care units need more competent nurses who have achieved at least a Bachelor of Science in Nursing degree in order to be qualified to provide high-quality nursing care and achieve better patient outcomes. Patients who are critically ill especially those who need mechanical ventilation require effective nursing care to avoid any possible complications ⁽²¹⁾. However, none of the participants had a postgraduate degree. Nurses who have higher education can implement an education program regarding common procedures based on evidence-based recommended practices. Thus nurses can update their knowledge and practices and provide effective care ⁽²²⁾.

Additionally, the results of this study showed that only 23.8% of the sample had previously attended an educational program or training related to ET suctioning, whereas the majority of the sample (76.2%) had not. This was also shown in a research ⁽¹⁸⁾ which found that 97.7% of ICU nurses had never participated in any prior ETS teaching or training. A different research by ⁽²³⁾ revealed that the majority of critical-care nurses (66.7%) had never attended an ETS training program. Contrastingly, ⁽²⁰⁾ discovered that the majority of participants (57.3%) had been trained in the suctioning process by critical care unit personnel. According to reports from other studies, the majority of nurses (75%) participated in ICU suctioning process training ⁽¹⁾. The present study's findings, when compared to those of earlier research, suggest that they may be more broadly applicable to recently graduated nurses with fewer than three years of experience in critical care units—who frequently lack sufficient understanding of ETS training. More education or training is necessary for critical-care nurses in order

to improve their expertise and standardize procedures. Furthermore, one of the most crucial things about critical care units is that nurses need to be extremely skilled and able to think critically in order to prevent any difficulties and be prepared to handle sudden medical concerns.

Based on the feedback provided by the participants, the findings indicate that a majority of critical-care nurses (93.7%) assume responsibility for their own education in relation to their core duties as such. They use online resources and scholarly publications to stay current with new developments and improve their abilities. There are several different methods that may encourage nurses to be self-educated such as promotion from their healthcare institution, financial support, awarding, and providing in-service hours assignments. These could be a motivation to nurses in order to improve their knowledge and skills which ultimately reflect better patient outcomes. In addition, professional nurses in the ICU carry at least four main principles: knowledge, skills, attitude, ethics, and values ⁽²⁴⁾

In terms of the experience of the critical-care nurses, our findings indicated that while 51.3% had typically more than four years of nursing experience, 26.3% had less than a year of experience working in critical-care units. Furthermore, the results showed that neither the participants' years of experience in critical care units nor their overall number of nursing jobs showed any statistically significant correlation.

There was only one right answer out of four choices for the multiple-choice questions in the knowledge section. In addition, the tool consisted of (20) items focused on endotracheal suctioning procedures in order to evaluate critical-care nurses' knowledge. The participants' responses were calculated and categorized as follows. Each question was given a score of 2 for the correct answer and 1 for the wrong answer. A score of 1 – 1.33 denoted poor knowledge; a score of 1.34-1.66 indicated fair knowledge and a score of 1.67-2 represented good knowledge.

The results of the current study indicate that the knowledge score was Fair overall.. The mean knowledge score was (1.80). This finding supports

the study conducted by ⁽¹⁰⁾ According to the researchers, all nurses in the Baghdad Hospital had fair knowledge and practices regarding endotracheal suctioning (47.8%). Another study conducted by ⁽²⁵⁾ further shown that, with a mean score of 17.07, nurses' endotracheal suctioning competence was inadequate. Additionally, a number of studies have demonstrated that the majority of nurses knew little to nothing about the suctioning process ^(13,18,19). This might be because nearly every participant in the current research had not previously received the ETS educational program.

As a result, in-service education should be given top priority by each hospital's continuing nursing education department in order to help nurses accept change, take responsibility for their actions, and broaden their understanding of how to achieve desired results. Following nurses' indoctrination, two crucial aspects of staff growth take place: education and training methods.

Strengths and limitations:

This study's strength is the use of standard instruments, which improves the validity of the findings and conclusion. The extensive comprehension of the research variables is limited by the use of a created questionnaire; however, this constraint can be offset by the high sample size and the diversity of healthcare sectors.

Conclusion:

Notably, just a minority had a Bachelor of Science in Nursing degree, indicating a potential educational gap in the qualifications required to provide high-quality nursing care in critical care units. Furthermore, The research revealed a significant lack of involvement in ETS training or educational programs among most critical-care nurses, perhaps impacting their moderate knowledge level on the topic. Ongoing education and training programs are crucial to improve nurses' knowledge and abilities, especially in essential areas like ETS, to optimize patient outcomes and reduce problems.

Although the survey showed low knowledge scores, it is positive to see that most critical-care nurses actively engage in self-education by using resources like the internet and research publications. Institutional support and incentives such as

promotion, financial assistance, and rewards might enhance nurses' motivation to participate in ongoing learning and enhance their expertise.

The study revealed no statistically significant correlation between nurses' years of experience in critical care units and their overall work experience as a nurse. This indicates that continuous education and training are crucial for improving nurses' competence and critical thinking skills in critical care environments, regardless of their level of experience.

Based on these results, hospitals should prioritize implementing in-service education programs that concentrate on ETS and other crucial procedures. These programs should be led by the continuing nurse education department. These endeavors are essential for promoting a culture of ongoing education, and responsibility, and improving quality of nursing documentation because nursing documentation is believed as important indexes to develop nursing care and ultimately enhancing patient results in critical care environments.

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Conflict of interests

No conflict of interest was declared by the authors.

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Data sharing statement

Supplementary data can be shared with the corresponding author upon reasonable request.

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